

# BREAKTHROUGHS FOR TOMORROW

Science for a Better Future



2023 Krembil Annual Report

The Krembil Research Institute (Krembil) is the research arm of Toronto Western Hospital (TWH) at University Health Network (UHN). Krembil's research programs focus on the brain and spine, vision and arthritis. Its laboratories are located at the Krembil Discovery Tower and at TWH's Main, McLaughlin and Fell Pavilions. Prior to November 13, 2015, Krembil was known as the Toronto Western Research Institute.

We acknowledge that the land on which we work is the traditional territory of many nations, including the Mississaugas of the Credit, the Anishnabeg, the Chippewa, the Haudenosaunee and the Wendat peoples, and is now home to many diverse First Nations, Inuit and Métis. We also acknowledge that Toronto is covered by Treaty 13 with the Mississaugas of the Credit. We remember and honour the legacy of the peoples who have been here before us and all who strive to make the promise and the challenge of Truth and Reconciliation real. We are grateful to have the opportunity to live and work on this land.

We are committed to championing inclusion, diversity, equality, equity and accessibility in the learning, work and service environments. We believe that our differences enrich our ability to develop creative and innovative approaches to delivering exemplary patient care, research and education.

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*About the cover: Dr. Mojgan Hodaie performing surgery for trigeminal neuralgia.  
Photo by Twayne Pereira, Krembil Communications & Brand Strategy*

*Cover Design: UHN's Strategic Research Initiatives Development (StRIDE) team*

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# Shaping Tomorrow's Care

At the Krembil Research Institute, the word *relentless* is not just a tagline.

*Relentless* describes a shared conviction—one that unifies Krembil trainees, staff, clinicians and researchers in our mission to advance medical discovery for a healthier future.

We are relentless in our pursuit of great science. We are relentless in our ability to overcome obstacles and move forward, despite the challenges that we face. And we are relentless in our drive to translate our discoveries into cures for devastating illnesses.

I joined Krembil in 2022 with one goal: to build on our success in producing some of the most important basic, translational and clinical research happening today. To do this, we are pushing boundaries by through world-class research and strengthening key scientific and community-based partnerships—widening the circle of people that are relentless in their pursuit of health for all.

In this report, you will find evidence of this strategy in action, including a new approach to determine the brain-aging effects of chronic pain, a 'map' of interactions between autism risk genes and proteins, and blood-based biomarkers that can predict the speed of osteoarthritis progression.

We also work to break down barriers between scientists and the public through educational outreach initiatives, including an annual virtual event to celebrate the International Day of Women and Girls in Science and our podcast *Your Complex Brain*.

It is amazing what we can do when we feel inspired, and inspiration comes in many forms. Perhaps you are inspired by a family member living with a disease, and that feeds your passion for research. Maybe you are inspired by a promise that you made to yourself to never give up on your dream of developing a cure for Parkinson's disease,

spondyloarthritis or macular degeneration. I often feel inspired by the community in which I live and work. Walking the streets of Kensington Market on my way to the Krembil Discovery Tower, I see people of all ages and backgrounds, working, laughing and living.

These members of our community want to continue to enjoy good health for many years to come—and we want that for them too.

That is why we focus on diseases of the brain, eyes, bones and joints: those that most often lessen our independence and quality of life as we get older. As our population ages, these diseases will quickly become more prevalent. This is why we need big ideas and new solutions, now more than ever.

At Krembil, our goal is to discover effective treatments to help people live longer, healthier lives, and to develop strategies to prevent these illnesses from occurring in the first place.

There are many ways you can help us achieve our goals. Support our research, participate in our outreach events and advocate on our behalf, because science is the only chance we have of combatting global health threats.

Our researchers are leading the way in creating innovative technologies, fostering fruitful collaborations, and training the next generation of scientists to ask the right questions and relentlessly search for answers.

These actions today are shaping the health care of tomorrow.

Warmly,



Dr. Jaideep Bains  
Director, Krembil Research Institute  
University Health Network



# Faces of Discovery



## Kristen Ashworth

MSc student supervised by Dr. [Brian Ballios](#),  
Donald K. Johnson Eye Institute

I study inherited retinal diseases (IRDs)—genetic eye conditions that lead to progressive vision loss and have no cures. Our lab uses experimental models called retinal organoids to develop and test stem cell therapies that can restore vision in people with these conditions.

One day, the insights that we glean from this research could help us develop cures for IRD-associated vision loss. We already have a Health Canada-approved gene therapy for one type of IRD and, in the next 10 to 15 years, I think we will see many more precision treatments.

As a young research trainee, it can sometimes be challenging to remember the value you add to a room full of experts. But I think every scientist, regardless of their career stage, brings value to the table. Diverse perspectives are critical for the out-of-the-box thinking that underpins so many important discoveries.

My approach is to be open to new experiences and ideas. Outside the lab, I am the Graduate Student Site Director at the University of Toronto's Institute of Medical Science (IMS) Student Association, and Executive Director and journalist for the IMS magazine. I also volunteer for Fighting Blindness Canada and UHN's STEM Pathways outreach program.



## Zhe 'Tim' Wu

Postdoctoral researcher supervised by Dr. [Kâmil Uludağ](#),  
Krembil Brain Institute

In Dr. Kâmil Uludağ's lab, our team is developing fast and robust magnetic resonance imaging (MRI) techniques to support research and patient care. My current studies focus on developing novel approaches for acquiring and reconstructing brain images.

I am currently developing neuroimaging and data processing tools that reduce scanning times, increase image resolution, and limit the interference produced by patient motion and other factors. These tools will improve the patient experience and provide rich information for scientists to build better models of the healthy and diseased brain.

Because my research goal is to optimize neuroimaging techniques to help patients, it is important for me to be able to work closely with clinicians and patients.

In the last decade, we have witnessed breakthroughs in mathematical theories that have led to innovative medical imaging methods. Now, we are experiencing another wave of change driven by artificial intelligence (AI). I am very excited to see where AI, machine learning and related technologies take us in the fields of medical imaging and biomedical science.



## Kiah Alyssa Spencer

MASc student supervised by Dr. [Luka Milosevic](#),  
Krembil Brain Institute

My research centres on Parkinson's disease and how to treat it. Specifically, I study neural plasticity—the ability of our neurons and their connections to change—in Parkinson's disease and in response to a therapy called deep brain stimulation (DBS).

DBS involves chronic, continuous electrical stimulation to brain regions from implanted electrodes to disrupt abnormal brain activity. I am developing a DBS protocol that involves periodic stimulation. By prolonging battery life, this protocol would reduce the frequency of clinic visits to replace batteries and could eventually replace the current standard of care.

I am always thrilled when I see changes in brain activity in the operating room that reflect clinical improvement. I am proud to contribute to research that will advance DBS technology and improve patients' lives.

I am grateful to be starting my career at Krembil. The researchers here are dedicated to supporting their trainees and there are plenty of funding opportunities and workshops for professional development. After graduate school, I hope to continue research focused on improving treatments for Parkinson's disease and other neurodegenerative conditions.



## Aos Aboabat

Clinical research fellow supervised by Dr. [Sindhu Johnson](#),  
Schroeder Arthritis Institute

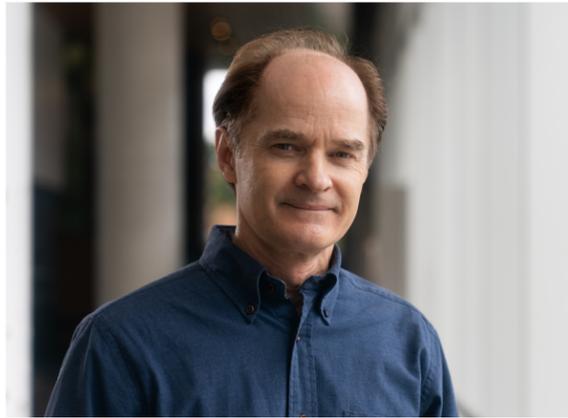
As a clinical research fellow at UHN, I study scleroderma spectrum disorders—autoimmune disorders that cause inflammation of the skin and other tissues.

After graduating from medical school at King Saud University in Riyadh, Saudi Arabia, I moved to Toronto where I completed my residency in internal medicine and rheumatology at the University of Toronto.

When I started my research fellowship in the Toronto Scleroderma Program, I received training through the Centre for Quality Improvement and Patient Safety (CQuIPS), a multidisciplinary unit led by the University of Toronto and three of its affiliated hospitals.

My research project focused on identifying strategies to improve the quality of diagnosis and treatment for people with scleroderma.

I believe the future of health research lies not only in advancing diagnostic tests and precision treatments but also in optimizing the way we deliver these innovations to patients. By integrating new technologies, evidence-based decision-making and quality-improvement principles, we can build a more patient-centered and effective healthcare system.



**Frank Vidic**

Senior Research Facilities Coordinator,  
Krembil Research Institute

I have been the Senior Research Facilities Coordinator at the Krembil Research Institute for 16 years. In total, I have been at UHN for 35 years, where I have filled various technical and support roles.

On a daily basis, I assist research groups with equipment purchases and maintenance. I also work with a variety of research support departments to oversee the security and management of shared research facilities. By providing a safe environment and expert technical support, I enable researchers to concentrate on their work.

A highlight of working at Krembil has been watching the Institute grow, from the Playfair Neuroscience Unit, to the Toronto Western Research Institute to the Krembil—now considered a world-class research hub. Another highlight is meeting so many brilliant, humble and dedicated people.

The future of health research is bright. When you bring together dedicated scientific and medical professionals and give them access to cutting-edge research facilities, the possibilities are endless.

I am very proud that my work helps to advance research and, ultimately, improve health care.



**Kathryn Tzimika**

Administrative Coordinator, Dr. [Cathy Barr's](#) lab,  
Krembil Brain Institute

I have worked with Dr. Cathy Barr at the Krembil Brain Institute for 23 years. I support research and community outreach activities that contribute to UHN's mission to transform lives through discovery and learning.

My days often involve managing human resources and lab inventories and overseeing the staff payroll. I also help our research team complete ethics applications and renewals and work with UHN's Research Solutions and Services departments to prepare grant applications and manage post-award activities.

I am very proud that I can help Dr. Barr with administrative tasks so she can focus on her important research into neuropsychiatric disorders, such as childhood-onset depression, attention-deficit/hyperactivity disorder and reading disabilities. I am excited to see our discoveries translated into tools and strategies to manage disease and alleviate suffering.

The best part of my job is the people. UHN attracts experts at all levels in patient care, research and education, making it the ideal environment for leading-edge discoveries. The Barr lab is also very tight-knit. Whether we are working on-site or remotely, we are always there to help each other and to celebrate grants, graduations and other milestones.



**Kyle Cheung**

Lab Manager, Dr. [Michael Reber's](#) lab,  
Donald K. Johnson Eye Institute

I am the laboratory manager for Dr. Michael Reber at the Donald K. Johnson Eye Institute. Our research has three primary areas of focus: characterizing the processes that control connectivity in the visual system; clarifying the effects of degenerative eye diseases on visual connectivity; and developing virtual reality-based rehabilitation methods to treat low vision.

I am incredibly proud of what our lab has accomplished in the field of virtual reality-based rehabilitation. This innovative therapy can improve the quality of life of people with visual deficits by helping them regain their visual function and independence.

The collaborative environment, cutting-edge resources and commitment to training at the Institute create an environment that drives innovation and discovery.

What excites me about the future of health research is the potential to make significant strides in improving health care outcomes, preventing diseases and prolonging healthy lives. The cross-functional teams that are focused on vision research are poised to create more precise, effective and accessible therapies that will help transform how we care for individuals living with vision disorders.



**Zoya Qaiyum**

Research Technician, Dr. [Robert Inman's](#) lab,  
Schroeder Arthritis Institute

I have worked in the laboratory of Dr. Robert Inman at the Schroeder Arthritis Institute since 2018. I study the immunological relationship between the gut and joints in axial spondyloarthritis—a debilitating form of arthritis that affects the bones and joints.

Having worked extensively to define the immune profiles of the joints of people with axial spondyloarthritis, I am now expanding my focus to look at the profiles of these patients' heart valves. Specifically, I am studying whether there are similarities in the immune profiles of these two distinct tissues. These studies have been challenging, but it has been exciting to explore how this disease affects various parts of the body.

I am also involved in research that uses sophisticated techniques, such as mass cytometry, imaging mass cytometry, and single-cell RNA and T cell receptor sequencing.

Working at the Schroeder Arthritis Institute gives me ample opportunities to collaborate with researchers and clinicians and access advanced research facilities. It also enables me to connect with the greater Krembil community through events like annual Research Days, where we present our work and brainstorm new ideas.



## Brain Aging in Fast Forward

*Dr. Mojgan Hodaie, Neurosurgeon and Senior Scientist;  
Krembil Brain Institute*

*Researchers use artificial intelligence to understand how chronic pain accelerates brain aging.*

**N**early 8 million Canadians live with some form of chronic pain. Researchers led by Dr. [Mojgan Hodaie](#) have used artificial intelligence (AI) to create a brain age calculator to explore the effects of chronic pain conditions on brain aging.

“We used AI to analyze magnetic resonance imaging (MRI) scans of the brains of over 900 adults. Using this approach, we created an algorithm that can accurately calculate a person’s brain age based on their brain structure and connectivity,” says Dr. Hodaie.

Several conditions are linked to accelerated brain aging, but studies of brain aging in chronic pain have turned up conflicting results. One likely explanation for this is that most research into the brain aging effects of chronic pain have examined brain structures in diverse groups of people who have distinct pain conditions.

“We overcame this limitation by considering three unique pain conditions—trigeminal neuralgia, osteoarthritis and chronic low-back pain—which often differ in terms of pain severity and frequency,” explains Dr. Peter Shih-Ping Hung, a former PhD student in Dr. Hodaie’s lab and the first author of the study.

The team’s findings showed that the effects of chronic pain on brain aging vary according to the underlying pain condition, with trigeminal neuralgia and osteoarthritis being linked to more rapid aging than chronic low-back pain.

Among people with trigeminal neuralgia, brains appeared to be over 10 years older than those of people without chronic pain. Moreover, earlier onset of chronic pain was linked to older brain age.

Interestingly, brain aging was also linked to treatment response—people with trigeminal neuralgia who had “older brains” were more likely to benefit from a common surgical treatment called Gamma Knife radiosurgery.

The team also considered participants’ sex, because chronic pain is more common and typically more severe in females than males.

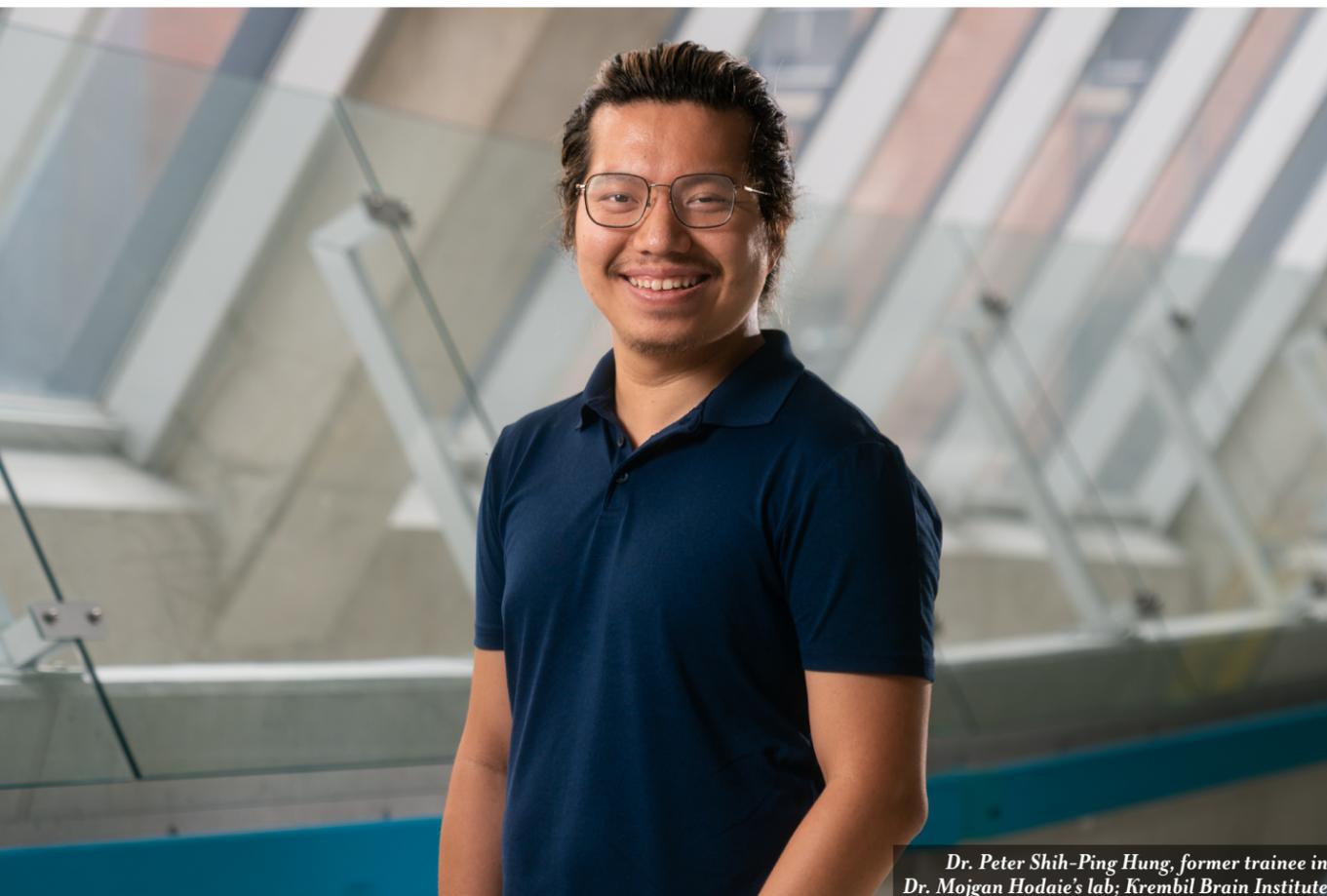
Their findings revealed that females are at a higher risk for accelerated brain aging than males. Females also experienced accelerated brain aging in response to all conditions tested, whereas males only experienced

accelerated aging in response to osteoarthritis. According to Dr. Hodaie, this study provides a more nuanced view of the links between various forms of chronic pain, sex and brain aging. “Defining brain age in people with chronic pain could be a major step forward for predicting treatment response and developing more targeted therapies.”

*Hung PS-P et al. Pain. 2022 Feb.*  
DOI: [10.1097/j.pain.0000000000002613](https://doi.org/10.1097/j.pain.0000000000002613)

*This study was supported by the Canadian Institutes of Health Research and UHN Foundation.*

*Dr. Hodaie is a Professor in the Department of Surgery at the University of Toronto and Surgical Co-Director of UHN’s Joey and Toby Tanenbaum Family Gamma Knife Centre.*



*Dr. Peter Shih-Ping Hung, former trainee in Dr. Mojgan Hodaie’s lab; Krembil Brain Institute*

## More Than Supporting Cells



*Dr. Maurizio De Pittà, Scientist; Krembil Brain Institute*

### *Astrocytes, a type of non-neuronal brain cell, may play an important role in working memory.*

Dr. [Maurizio De Pittà](#) has created the first computational model of the role of glial cells in cognition, revealing that neuron-glia interactions may mediate working memory.

Working memory is the short-term storage of small amounts of information to support ongoing tasks, such as remembering a phone number while dialing it.

This process involves distinct patterns of neuron activity and changes in the strength of neuron connections. It was previously believed that neuron-neuron interactions alone account for these features, but Dr. De Pittà discovered a necessary role for glia.

One type of glial cell, known as an astrocyte, influences the activity of nearby neurons.

To investigate whether astrocytes are involved in working memory, Dr. De Pittà worked with his colleague Dr. Nicolas Brunel at

Duke University to model the activity of neuron networks with and without these cells. Their model revealed that astrocytes release chemicals to rapidly alter neuron connections.

By strengthening or weakening connections, astrocytes enable subsets of neurons within a network to display different activity patterns at the same time. This ability enables networks to simultaneously encode different types of information, supporting working memory.

Dr. De Pittà hopes to eventually create a high-fidelity model of the brain’s neuron-glia interactions, which could help to identify changes that contribute to brain disorders.

“We are what we are wired by,” says Dr. De Pittà. “Understanding how glial cells connect to and interact with neurons is crucial to understanding how the brain works.”

[Full Story / Scientific Article](#)

## Predicting Disease Progression

*Dr. Mohit Kapoor, Co-Director and Senior Scientist;  
Schroeder Arthritis Institute*

*Blood-based molecules may predict how quickly knee osteoarthritis will become more severe.*

**O**steoarthritis (OA) is the most common form of arthritis and a leading cause of disability in adults over the age of 65. Joint deterioration in OA can progress quickly or slowly, but clinicians have no way of knowing which individuals will experience rapid disease progression.

A research team led by Dr. [Mohit Kapoor](#) identified circulating molecules that can be used to distinguish patients with fast-progressing, slow-progressing and stable knee osteoarthritis.

“We previously identified circulating microRNAs—small molecules that can alter gene expression—that contribute to joint damage in osteoarthritis,” says Dr. Kapoor. “These molecules have great promise as predictive markers of disease progression because they can be easily detected in a patient’s blood before the onset of advanced joint damage.”

The team examined microRNA expression in blood samples from over 100 patients in the Osteoarthritis Initiative—a large cohort of clinical data from patients who have experienced knee OA for 10 years or more.

The researchers analyzed blood samples that were collected at baseline when patients had mild osteoarthritis and four years later. They categorized the patients into three groups based on how quickly their disease progressed: fast progressors exhibited moderate to

severe OA by the four-year follow-up; slow progressors experienced worsening disease by the eight-year follow-up; and non-progressors did not experience worsening symptoms over the study period.

Using this approach, the team identified several circulating microRNAs that are associated with fast-progressing disease. “Patients with fast-progressing OA had higher levels of 48 microRNAs at baseline compared to those with slow- and non-progressing disease,” explains Dr. Osvaldo Espin-Garcia, a biostatistician at the Schroeder Arthritis Institute. “Among these were members of the microRNA-320 family, which target genes involved in inflammation and joint damage.”

This finding suggests that elevated levels of these microRNAs in a patient’s blood may signal rapid osteoarthritis progression.

“Clinicians could eventually screen patients for these markers to identify those at the

greatest risk of disease progression,” says Dr. Shabana Amanda Ali, a former postdoctoral researcher in Dr. Kapoor’s lab and co-first author of the study. “This would open a new treatment window during which patients could be prescribed preventative interventions or be enrolled into clinical trials for promising experimental therapies.”

Ali SA et al. *Ther Adv Musculoskelet Dis.* 2022 Mar. DOI: [10.1177/1759720X221082917](https://doi.org/10.1177/1759720X221082917)

*This work was supported by the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation, the Government of Ontario, the Arthritis Society, the IBM and Ian Lawson van Toch Fund, the Krembil Foundation and UHN Foundation.*

*Dr. Kapoor is Co-Director and Senior Scientist at the Schroeder Arthritis Institute and a Professor in the Departments of Laboratory Medicine & Pathobiology and Surgery at the University of Toronto. He holds a Tier I Canada Research Chair in the Mechanisms of Joint Degeneration.*



Dr. Shabana Amanda Ali, Assistant Scientist; Henry Ford Health



Dr. Osvaldo Espin-Garcia, Biostatistician; Schroeder Arthritis Institute

# Maintaining Immune Balance



Dr. Joan Wither, Senior Scientist; Schroeder Arthritis Institute

*A cellular balancing act keeps people with antinuclear antibodies from developing autoimmune diseases.*

Researchers led by Dr. [Joan Wither](#) have identified immune system factors that prevent and promote the development of systemic autoimmune rheumatic diseases (SARDs), such as lupus and Sjögren’s disease.

SARDs are rare inflammatory conditions associated with the production of high levels of antinuclear antibodies (ANAs), which attack the body’s tissues.

A positive ANA test signals that ANAs are detectable in the blood and typically indicates the presence of an autoimmune disease. However, ANAs can be detected years before the onset of autoimmune symptoms and in a subset of healthy individuals who will never develop a SARD.

The team set out to learn what immunological changes promote the development of autoimmune symptoms and SARDs, and what factors slow or prevent symptom development.

The team found that ANA+ people (those with a positive ANA test) had high levels of particular immune cells, such as antibody-producing B cells and T helper cells, compared to ANA- people.

Among ANA+ people, those without symptoms had higher levels of regulatory immune cells than those with symptoms. Those who progressed to develop SARDs had higher levels of pro-inflammatory immune cells than those who did not.

These findings suggest that the key difference between symptomatic and asymptomatic people who have positive ANA tests lies in the delicate balance between pro-inflammatory and regulatory immune cell activity. This balance is disrupted in SARDs in a way that favours inflammation.

[Full Story / Scientific Article](#)



## Building a Potential Drug

*Drs. Frank Lee, Scientific Associate (L) and Mark Reed, Staff Scientist (R); Centre for Medicinal Chemistry and Drug Discovery*

*Researchers synthesize a molecule that could treat glaucoma and other inflammatory diseases.*

**S**cientists at the Donald K. Johnson Eye Institute and Krembil's Centre for Medicinal Chemistry and Drug Discovery (CMCDD) report the successful chemical synthesis of lipoxin B<sub>4</sub> (LXB<sub>4</sub>), a molecule with neuroprotective properties.

LXB<sub>4</sub> is a small lipid molecule that dampens inflammation. Researchers led by Dr. [Jeremy Sivak](#) previously discovered that this molecule is produced in the retina—the light-sensing tissue that lines the back of the eye. In this tissue, LXB<sub>4</sub> protects neurons from damage in models of glaucoma, a leading cause of vision loss and blindness in adults.

“We have been exploring whether we can stimulate the body to produce more LXB<sub>4</sub> or deliver a synthetic version of the molecule directly into the retina to treat glaucoma,” says Dr. Sivak.

After discovering LXB<sub>4</sub>'s neuroprotective activity, the team focused on strategies to reproduce the molecule in the lab so they could study its biological effects.

To accomplish this, the group partnered with CMCDD, led by Staff Scientist and medicinal chemist Dr. Mark Reed.

Starting with readily accessible chemical building blocks, Dr. Reed's team applied contemporary synthetic organic chemistry methods to build the complex molecule from scratch. The team confirmed the molecule's

precise structure for the first time and demonstrated that it protects retinal neurons in a test of cell survival.

“Now that we can produce LXB4 in large quantities and easily modify the molecule, we can explore strategies to enhance its action to treat inflammatory and neurodegenerative diseases,” says Dr. Frank Lee, a Scientific Associate at CMCDD.

In addition to the molecule serving as a potential treatment for glaucoma, a deeper understanding of LXB4 could unlock new treatments for a wide variety of diseases in which inflammation is a contributing factor.

“Drug development is a complex undertaking—it often takes over 10 years to bring a new

drug to market,” says Dr. Reed. “The close collaboration between scientists and in-house medicinal chemists at Krembil is enabling us to accelerate this process and translate our discoveries into potentially life-changing therapies.”

*Lee CF et al. Chemistry. 2022 May.*  
DOI: [10.1002/chem.202200360](https://doi.org/10.1002/chem.202200360)

*This work was supported by Toronto Innovation Acceleration Partners, the Krembil Foundation and UHN Foundation.*

*Dr. Sivak holds the Graham Trope Chair in Glaucoma Research and is an Associate Professor in the Department of Ophthalmology & Vision Sciences at the University of Toronto (UofT). Dr. Reed is a Staff Scientist at the Krembil Research Institute and an Assistant Professor in the Department of Pharmacology & Toxicology and the Department of Chemistry at UofT.*



*Dr. Jeremy Sivak, Senior Scientist;  
Donald K. Johnson Eye Institute*

## Protein Level Insights



*Dr. Karun Singh, Senior Scientist;  
Donald K. Johnson Eye Institute*

### *Study identifies key protein interactions associated with autism.*

Researchers have identified hundreds of risk genes for autism, but it is unclear how genetic changes affect the inner workings of cells in the nervous system to trigger the condition.

To clarify the root causes of autism, researchers led by Dr. [Karun Singh](#) revealed how autism risk genes interact with one another and how they affect the function of proteins in the cell.

The team developed a strategy to define how 41 proteins that are encoded by autism-risk genes interact within neurons. “A unique element of this study is that we used proteomics—the large-scale study of the structure and function of proteins—to determine if and how risk genes and their associated proteins converge onto shared molecular pathways,” says Dr. Singh.

They discovered that many of these proteins play important roles in basic neuron functions. While their results confirmed functions that are already known to be involved

in autism, such as communication between cells, they also identified a new function linked to the condition: energy production (i.e., changes in cellular metabolism).

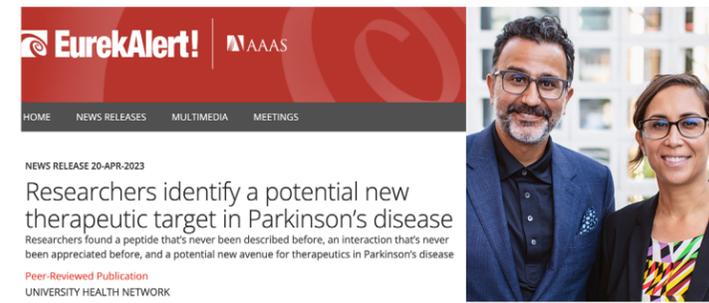
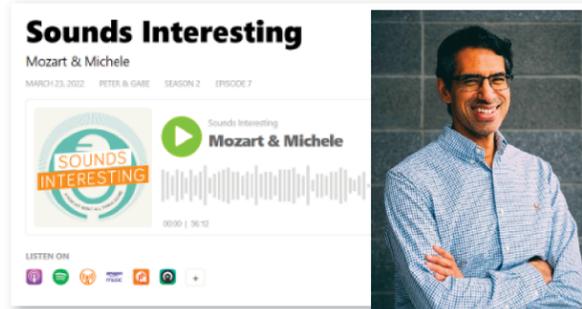
Using gene-editing techniques, the team discovered that several of the risk genes regulate the activity of mitochondria, the energy factories within cells.

Because neurons require large amounts of energy, disrupting mitochondrial activity can dramatically affect brain function. This helps explain how changes in these genes could alter brain activity and cause disease symptoms.

By shedding light on the cellular changes underlying autism, these findings could lay the foundation for treatments that are better targeted to individual patients.

[Full Story](#) / [Scientific Article](#)

# Krembil in the Media



20+   
 MEDIA APPEARANCES

Number of media appearances by Krembil Scientists on CTV, CBC, Global News, The Globe and Mail, Toronto Star, National Post, Washington Post, BBC, Best Health, Popular Science, NPR and Reader's Digest



3k   
 MEDIA EXPOSURES

Number of times 'Krembil' was mentioned in print and online publications



## NOTABLE MEDIA FEATURES

Combination of treatments for glioblastoma shows promise for patients with brain cancer. Featuring Drs. Gelareh Zadeh and Farshad Nassiri, Krembil Brain Institute, in The Globe and Mail, CTV, CBC and National Post.

New robotic device helps patients needing surgery for knee osteoarthritis recover faster, with more predictable outcomes. Featuring Dr. Michael Zywiol, Schroeder Arthritis Institute, on CBC, CTV and NEWSTALK 1010.

Doctors are studying the long-term impact of wildfire smoke on our vision. Featuring Dr. Marisa Sit, Donald K. Johnson Eye Institute, on CBC and CTV.

11k   
 SOCIAL MEDIA FOLLOWERS

Total number of followers on Facebook, Instagram, LinkedIn, X and YouTube



70k   
 SOCIAL MEDIA EXPOSURES

Number of times social media users saw, read or interacted with Krembil content

# Celebrating Leadership

On May 2, 2023, the Krembil Research Institute hosted a symposium to celebrate Dr. [Donald Weaver](#)'s tenure as Institute Director from 2013 to 2022.

The event, titled "The Don Weaver Symposium—Molecules, Poetry & Exploring New Approaches in Neuroscience" honoured Dr. Weaver's scholarship, mentorship, leadership and legacy at Krembil.

The half-day event was held at the BMO Education & Conference Centre and featured remarks on the birth and evolution of Krembil, including the creation of the Krembil Brain Institute, the Donald K. Johnson Eye Institute and the Schroeder Arthritis Institute.

The event also highlighted Krembil initiatives to support trainees and academic talks on the following topics:

- the burden of neurological disease;
- new directions for treating Alzheimer's;
- targeting excitotoxicity in Alzheimer's; and
- inflammation as a druggable target.

The event concluded with an inspiring talk from Dr. Weaver, in which he described his

latest research on Alzheimer's disease as a disorder of innate immunity and the need for out-of-the-box thinking to transform the way we study and manage this condition.

In a touching conclusion, Dr. Weaver described what motivates him every day: the more than 10,000 patients that he treated for Alzheimer's and related dementias during his 40-year career as a neurologist.

During the symposium, Dr. Brad Wouters, UHN's Executive Vice President of Science and Research, announced a new funding opportunity established in honour of Dr. Weaver's research and leadership: The Donald Weaver Postdoctoral Researcher Fellowship in Neurodegeneration Research.

This fellowship will provide salary support for one postdoctoral researcher working in the field of neurodegenerative diseases within the Krembil Research Institute.

Dr. Weaver was also presented with a new research chair—the Krembil Chair in Drug Discovery in Alzheimer's Research—made possible by the Krembil family, the Krembil Foundation and UHN Foundation.

This five-year chair will support his research into the design of brain-penetrating, small-molecule therapies for Alzheimer's disease.

"This chair represents a new level of support for Dr. Weaver's innovative approaches to drug development for Alzheimer's disease and related dementias," said Dr. Wouters. "We are extremely excited about his appointment to this new chair, and we wish him continued success as he rededicates himself to research."

*Dr. Weaver is one of a few people worldwide who co-qualifies as a neurologist and a medicinal chemist. He is internationally renowned for his expertise in drug discovery and translational research in Alzheimer's disease and related dementias.*

*Over his illustrious career, Dr. Weaver has published more than 400 peer-reviewed articles, pioneered the concept of 'micropharma' while co-founding eight biotech companies, and trained over 160 postdoctoral researchers and students.*



## Under Dr. Weaver's leadership, Krembil:

Established three institutes in one institute model

Recruited 26 investigators and established formal research appointments for Clinicians and Allied Health professionals

Established the Krembil Computational Neuroscience Hub

Launched the Collaborative Seed Grant program, bringing together basic and clinical research

Created the Centre for Medicinal Chemistry and Drug Design

KCNhub





Dr. Karen Davis, Senior Scientist;  
Krembil Brain Institute

## Science is for Everyone

Nearly 4,000 students, parents and teachers from around the world attended Krembil's 2023 livestream to celebrate the International Day of Women and Girls in Science.

The free event was moderated by CBC host Mary Ito and featured three women scientists who work in the areas of brain, vision and arthritis research at Krembil.

Each speaker gave a TED-style talk about their life, career and inspirations, and answered questions submitted by attendees.

- Dr. [Karen Davis](#) described advances in pain research and her commitment to helping women advance their careers in science;
- Amina Adama discussed her non-linear path to vision research, first aspiring to be a pediatrician; and
- [Laura Passalent](#) shared stories about her world travels and what inspires her work in musculoskeletal disease research and rehabilitation.

The event also featured the Honourable Marci Ien, Canada's Minister for Women and Gender Equality and Youth, who shared an inspiring message about the power of education.

"Seek and give mentorship wherever you can. The power that comes from working hard and working together is limitless."

"Perhaps there is a future researcher in the audience who will cure Alzheimer's, glaucoma or rheumatoid arthritis," says Krembil Director Dr. Jaideep Bains. "That is why we do this—so students are encouraged to pursue careers in science."

*In 2022, the annual event won the Canadian Online Publishing Awards Silver Medal for Best Virtual Event/Webinar (consumer category).*



Amina Adama, PhD Candidate;  
Donald K. Johnson Eye Institute



Laura Passalent, Advanced Practice Physiotherapist;  
Schroeder Arthritis Institute



Marci Ien, Member of Parliament;  
Minister for Women and Gender Equality and Youth

## Seeds of Science

UHN has over 1,300 research trainees—each with a different background, perspective and story to share.

*Seeds of Science* is a trainee-led podcast that showcases how today's junior researchers are growing in their scientific careers.

Through interviews with UHN graduate students and postdoctoral researchers, the podcast delves into what it is like to be a budding scientist at Canada's top research hospital. It explores trainees' goals, journeys in research, and strategies for overcoming challenges in and outside of the lab.

"Trainees are an indispensable part of any research institution and we want to give them a platform to learn from one another," says podcast co-host Dr. Emily Mills.

"We are thrilled to put a spotlight on these young scientists and their exciting work," adds co-host Dr. Rima El-Sayed.

*Seeds of Science* is now in its second season and available on [Spotify](#), [Apple Podcasts](#) and [Buzzsprout](#). For more information, visit the UHN Office of Research Trainees [website](#).



Drs. Emily Mills (L) and Rima El-Sayed (R);  
hosts of *Seeds of Science*

## Krembil Research Day

This year's Research Day brought together approximately 225 trainee researchers, faculty and staff.

The event kicked off with opening remarks from Krembil Director Dr. Jaideep Bains, who praised trainees for their contributions to the Institute and expressed his excitement for the opportunity to come together to discuss discoveries.

"You are the lifeblood of this Institute. You bring the energy, the ideas and the talent. Thank you for everything that you do," said Dr. Bains.

The event featured nine talks and over 70 poster presentations that showcased the depth and breadth of work conducted in the areas of brain, vision and arthritis.

The event concluded with a keynote address from Dr. Sheena Josselyn, a Senior Scientist at The Hospital for Sick Children, and a distinguished researcher in the field of memory and cognition. Her talk explored the intricacies of memory formation, her journey in science, and the importance of mentorship and collaboration.



Postdoctoral researchers, Drs. Rajasumi Rajalingam and Sara Martin,  
discussing data at Research Day

# Your Complex Brain

A podcast from  
Krembil Brain Institute

Subscribe Today!



Dr. Kathryn Curtis  
Psychologist



Roshan Malhan  
Medical Student



Natalie Ladly  
Patient Partner



Richard Logan  
Lab Manager

Season 2 of *Your Complex Brain* features interviews with (clockwise from top left) UHN psychologist Dr. Kathryn Curtis, medical student Roshan Malhan, patient partner Natalie Ladly and Krembil lab manager Richard Logan.

On March 21, 2023, the Krembil Brain Institute launched season 2 of *Your Complex Brain*. This educational podcast explores the mysteries, myths and cutting-edge science related to the brain and brain diseases, such as Alzheimer's disease, Parkinson's disease and chronic pain.

*Your Complex Brain* features one-on-one interviews with leading neuroscientists, clinicians and health care staff from the Krembil Brain Institute, and inspirational personal accounts of brain disease, injury and recovery from patients and their families.

This podcast is meant to inform, engage and inspire people who are affected by brain disease, as well as those who are interested in learning more about the innovative brain research being conducted at UHN.

The podcast also shines a light on some of the Institute's talented trainees and its collaborations with national and international teams and advocacy organizations that are key to world-class discoveries.

Season 2 explores a wide range of brain-related topics, including:

- a new theory of Alzheimer's disease;
- the future of deep brain stimulation;
- how the brain responds to chronic pain; and
- the challenges of studying rare disorders.

One inspiring episode features Harry Forestell, CBC anchor and grateful patient. "I can't say enough about the care and quality of treatment I received during my deep brain stimulation surgery at the Krembil Brain Institute," says Forestell. "I know this might only give me another 10 to 15 years, but 10 to 15 years can be a lifetime. I just hope others with a similar diagnosis have the same opportunity, with the result that I've had."

The podcast is hosted by Krembil's Manager of Communications, Heather Sherman, and produced by Jess Schmidt and Krembil team members Dr. Amy Ma, Carley McPherson, Twayne Pereira and Sara Yuan.

*"This podcast is a fantastic way to connect with the public and share the amazing science and innovation that is taking place at the Krembil Brain Institute."*

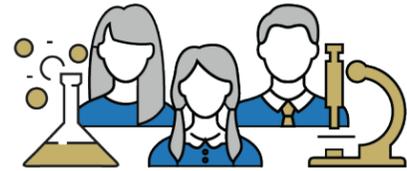
—Krembil Director Dr. Jaideep Bains

*Your Complex Brain* is available on all major podcast platforms, including [Apple Podcasts](#), [Spotify](#) and [Google Podcasts](#). For more information, visit [www.uhn.ca/Krembil/Complex-Brain-Podcast](http://www.uhn.ca/Krembil/Complex-Brain-Podcast).

With over 30,000 downloads, *Your Complex Brain* won the 2023 People's Choice Award for Best Science & Medicine Podcast and was a finalist for the 2022 Canadian Online Publishing Podcast Awards.

# Krembil by the Numbers

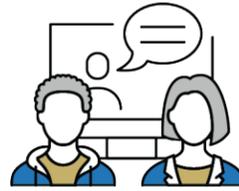
**206**  
Principal Investigators



**273**  
Staff Members



**279**  
Trainees



**138.9k**  
sq. ft. of Research Space



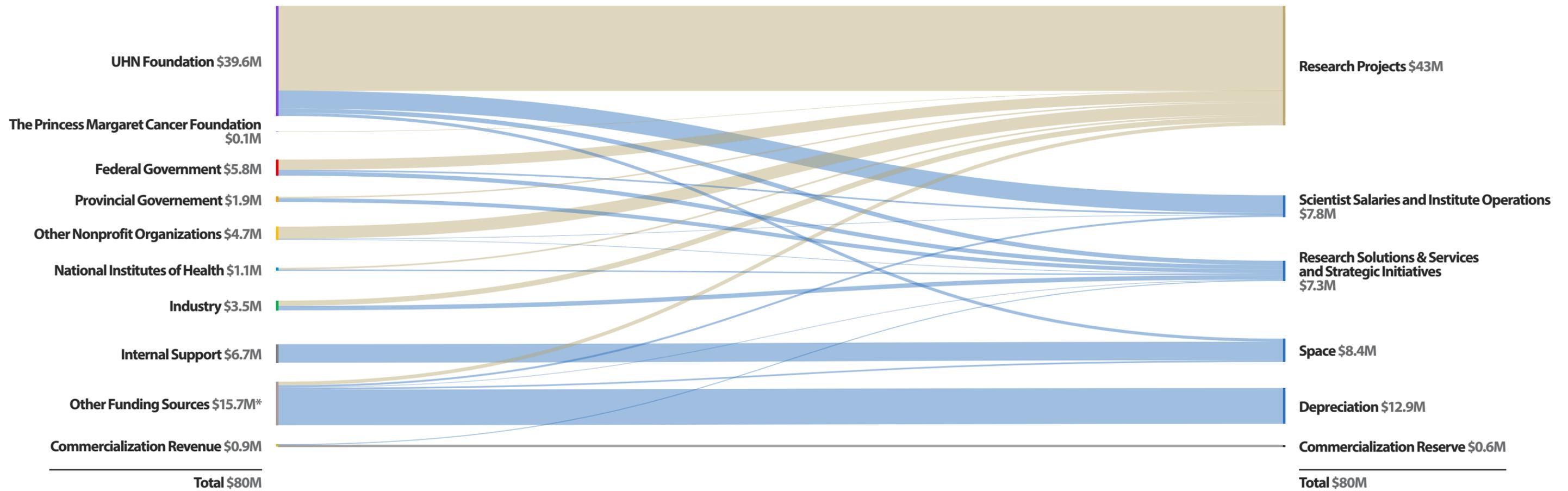
**1,012**  
Publications



**\$80M**  
Funding



## Research Funding



\*These funds do not originate from the Ontario Ministry of Health or the Ontario Ministry of Long-Term Care.

In this fiscal year, all funding amounts originally attributed to Techna Institute, prior to its transition to a clinical accelerator, were redistributed among the other research institutes according to changes in PI affiliations. The redistributed value is \$1.6M for Krembil Research Institute.

# Awards and Distinctions

## Danielle Andrade

Dravet Award, Fundación Síndrome de Dravet

## Elizabeth Badley

Top 10 Arthritis Research Advances of 2022, Arthritis Society of Canada

## Hance Clarke

President-Elect, Canadian Pain Society

## Sindhu Johnson

Presidential Service Award, American College of Rheumatology  
Stars Career Development Award, Arthritis Society of Canada

## Andres Lozano

Spiegel-Wycis Award, World Society for Stereotactic and Functional Neurosurgery

## Massieh Moayedi

Early Researcher Award, Government of Ontario

## Philip Peng

Gold Medal Award, Canadian Anesthesiologists' Society

## Anthony Perruccio

Top 10 Arthritis Research Advances of 2022, Arthritis Society of Canada

## Kim Tsoi

Tier II Canada Research Chair in Translational Sarcoma Research (new)

## Valerie Wallace

Fellow, Canadian Academy of Health Sciences

## Donald Weaver

Oskar Fischer Prize—Silver, University of Texas at San Antonio



Top (L to R): Omar Cruz Correa, Daniel Pereira, Fadi Kharouf, Brian Tom, Nicholas Chronis, Jennifer Dutra, Anne McKinnon, Shangy Gao, Jerry Lawless; Middle (L to R): Steven Dang, Maryam Obaidallah, Shahad Al-Matar, Nikita Looby, Sheng Han Li, Semini Jathunga, Utsavi Nimbark, Tina Ko, Mohadeseh Ahmadvand, Morris Manolson; Front (L to R): Juan Padolina, Pavi Sivanewaran, Darshini Ganatra, Dafna Gladman, Vinod Chandran, Cheryl Rosen, Sutha Shanmugarajah, Navita Sharma, Sreemoyee Gosh, Gabriela Rodriguez Herrera, Sowmya Viswanathan; Psoriatic Arthritis Research Group, Schroeder Arthritis Institute



M-GAIT Lab. Using immersive lab technology to help patients with Parkinson's disease. Movement Disorders Clinic, Krembil Brain Institute

# Krembil Researchers

## Emerita/Emeritus Scientists

Elizabeth Badley  
Vincent Chan  
Charles Tator

## Senior Scientists

Jaideep Bains  
Cathy Barr  
Jonathan Brotchie  
Peter Carlen  
Robert Chen  
Karen Davis  
James Eubanks  
Michael Fehlings  
Dafna Gladman  
Nigil Haroon  
Mojgan Hodaie  
William Hutchison  
Martin Ingelsson  
Robert Inman  
Igor Jurisica  
Lorraine Kalia  
Suneil Kalia  
Mohit Kapoor  
Armand Keating  
Sidney Kennedy  
Lakshmi Kotra  
Gabor Kovacs  
Anthony Lang  
Andres Lozano  
Nizar Mahomed  
Rosemary Martino  
Mary Pat McAndrews  
David Mikulis  
Philippe Monnier  
Anthony Perruccio  
Ivan Radovanovic  
Michael Reber  
Karun Singh  
Jeremy Sivak  
Frances Skinner  
Antonio Strafella  
Shuzo Sugita  
Michael Tymianski  
Kâmil Uludağ  
Taufik Valiante  
Valerie Wallace

Donald Weaver  
Joan Wither

## Scientists

Brian Ballios  
Vinod Chandran  
Melanie Cohn  
Maurizio De Pittà  
Christopher Kim  
Milad Lankarany  
Luka Milosevic  
Olga Lucia Rojas  
Zahi Touma  
Sowmya Viswanathan  
Liang Zhang

## Affiliate Scientists

Daniel Buchman  
Jaskarndip Chahal  
Moshe Eizenman  
Brenda Gallie  
Magdy Hassouna  
Walter Kucharczyk  
Jérémie Lefebvre  
Massieh Moayed  
Behdin Nowrouzi-Kia  
Vitor Mendes Pereira  
Graham Trope  
Naomi Visanji

## Krembil Clinician Scientists

Michael Brent  
Rajiv Gandhi  
Aylin Reid

## Krembil Clinician Investigators

Danielle Andrade  
Heather Baltzer  
Mark Bernstein  
Anuj Bhatia  
Yvonne Buys  
Frances Chung  
Hance Clarke  
Robert Devenyi  
Dean Elterman  
Alfonso Fasano

Susan Fox  
Kenneth Fung  
Yasmine Hoydonckx  
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David Rootman  
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Mandeep Singh  
Allan Slomovic  
David Tang-Wai  
M. Carmela Tartaglia  
Christian Veillette  
Jean Wong  
Mateusz Zurowski

## Clinician Scientists

Monica Daibert Nido  
Tania Di Renna  
Sindhu Johnson  
Timo Krings  
Laurie Connie Marras  
David Mathew  
Victoria McCredie  
Kieran Murphy  
Peter St George-Hyslop

## Clinician Investigators

Tarek Abdelhalim  
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Matthew Schlenker  
Frank Silver  
Shaun Singer  
Marisa Sit  
Maxwell Slepian  
Elizabeth Slow  
Roger Smith  
Emily Swinkin  
Khalid Syed  
Peter Tai  
Kim Tsoi  
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Daphne Voineskos  
Herbert von Schroeder  
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Dr. Monica Nido, Ophthalmologist,  
Low Vision Rehabilitation Clinic;  
Donald K. Johnson Eye Institute

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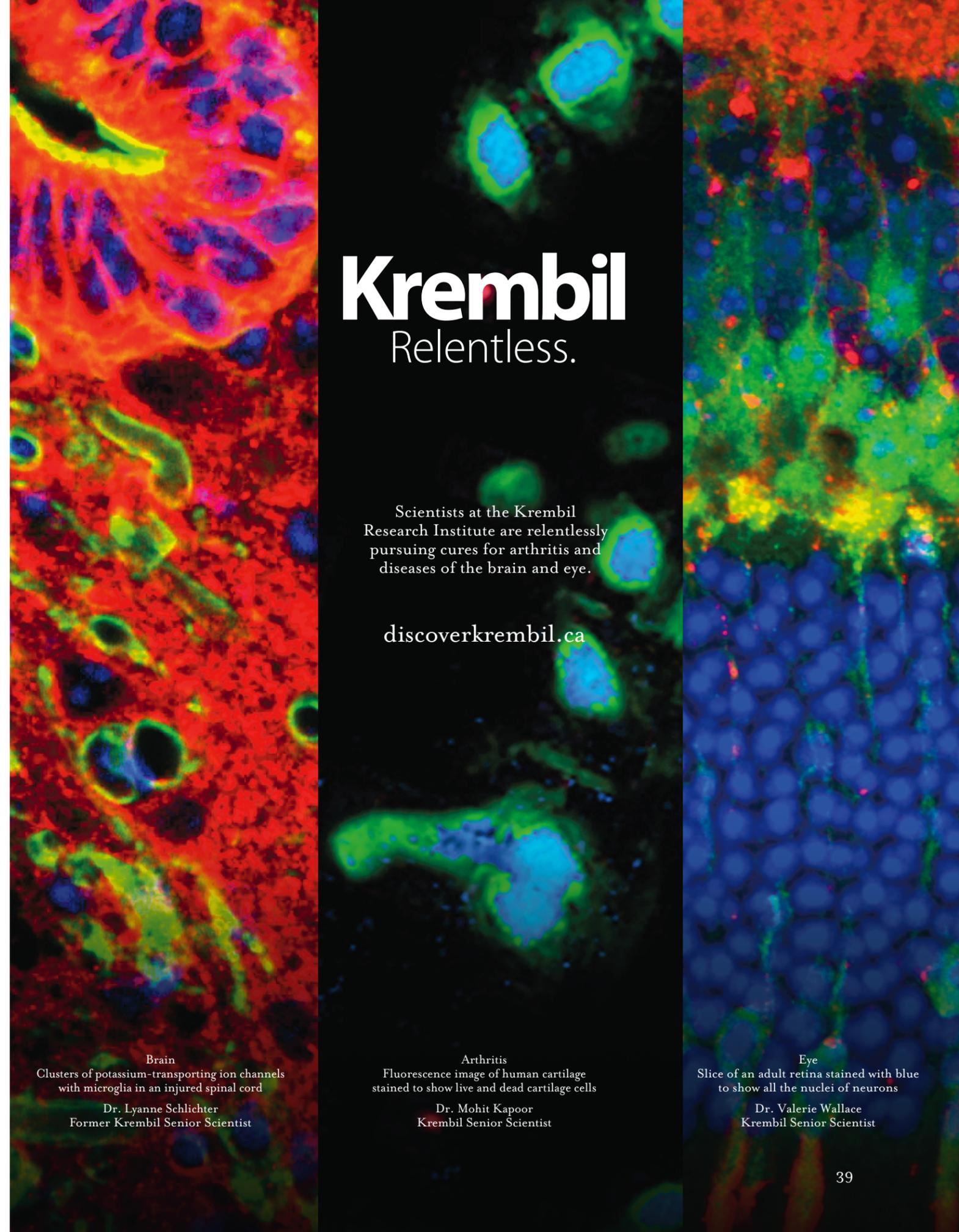
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Gelareh Zadeh, *Co-Director (Clinical), Krembil Brain Institute*

## Disclaimers

All data are reported for the 2023 fiscal year ending on March 31, 2023.

RESEARCHER DATA provided by UHN's Research Analytics. STAFF & TRAINEE DATA provided by UHN's People & Culture (formerly Human Resources) and includes Krembil investigators, their trainees and staff. SPACE DATA provided by UHN's Facilities Management - Planning, Redevelopment & Operations (FM-PRO). FINANCIALS DATA provided by UHN's Research Financial Services. The financials graph on pages 30-31 shows how research funding was used towards Krembil's research mission for the fiscal year ending on March 31, 2023. Values are rounded to the nearest \$100,000. For UHN's audited financial statements, please visit [www.UHN.ca](http://www.UHN.ca). PUBLICATIONS DATA provided by UHN's Research Analytics. Publications include articles, reviews and proceedings papers in journals indexed in the Web of Science (WoS) Core Collection (Clarivate), where the author list includes at least one Krembil researcher from the March 31, 2023 researcher data snapshot. Publications authored by more than one Krembil researcher are counted once in the Institute's total number of publications. PRODUCTION CREDITS: This report is published and designed by Krembil's Directorate Office. Elements of this report were prepared by UHN's Strategic Research Initiatives Development (StRiDe) and UHN's Communications and Brand Strategy.



# Krembil Relentless.

Scientists at the Krembil Research Institute are relentlessly pursuing cures for arthritis and diseases of the brain and eye.

[discoverkrembil.ca](http://discoverkrembil.ca)

Brain  
Clusters of potassium-transporting ion channels with microglia in an injured spinal cord

Dr. Lyanne Schlichter  
Former Krembil Senior Scientist

Arthritis  
Fluorescence image of human cartilage stained to show live and dead cartilage cells

Dr. Mohit Kapoor  
Krembil Senior Scientist

Eye  
Slice of an adult retina stained with blue to show all the nuclei of neurons

Dr. Valerie Wallace  
Krembil Senior Scientist



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